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An Autobiography and Some Reminiscences of the Late August Fendler. II.

EDITED BY WM. M. CANBY.

Let us now give, by extracts from his letters, a fuller account of his life in Venezuela. In a letter written to Dr. Gray, in December, 1854, he says: "On my arrival * * * * (at Colonia Tovar), I found a chance to buy a small farm, with the produce that was on it and a small cottage, for $47." One can not help wishing for more definite information regarding the size of the "farm," the amount of produce, and the style of cottage, all of which could be purchased for $47! And the place seems like a veritable Garden of Eden, when farther on he discourses thus: "A visitor who never before lived in a valley like this, finds here many peculiarities of vegetation, surface and climate, which make him feel that he is not far off the land of perpetual peace; for he has entered the happy region of the ferns, the 'tierra templada de los helechos.' There is no scorching summer's heat, no fearful winter's cold, neither tornadoes to devastate the country, nor gales to blind the inhabitants with sand or dust, or penetrate their clothes and flesh with piercing frost. Lightnings are rare and rather harmless, thunders merely grumbling. * * * * * The mean temperature of April was 63.3°; May, 63.9°; June, 63°; July, 62.4°; August, 63.62°; September, 63.5°; October, 63.44°; November, 62.52°. Very seldom the temperature gets as low as 50°, and yet more rarely it rises to 78°. These two degrees (50 and 78 F.), seem to be the limits which are never exceeded in these months. The common temperature ranges between 56° and 70°. I am told that in January and February the temperature may be a few degrees lower in the morning, but otherwise about the same as in all the other months. The temperature of this valley therefore is that of a perpetual spring. Yet there is some variety in the climate with regard to moisture, viz.: the dry and rainy seasons. * * * * In the dry season if there is at any time moisture enough in the atmosphere to be condensed the mountainous districts are sure to get it. The judicious farmer is therefore enabled to plant and reap at any time the whole year round, for if the rain should fail abundance of spring water, which rushes and leaps down from all sides in numerous rivulets to every man's field, can be made to restore moisture to the soil. In fact, my brother, who is with me, plants small patches of potatoes once every fortnight, month after month. * * * * My cottage stands on a small hill which is projecting from the sloping side of a mountain overlooking the greater part of the colony. On the slopes of this little hill we have made terraces, planted with Musa sapientum, with apple trees, palms (Conocarpus utilis) and a stately tree fern fourteen feet high. Near the brown polished stem of the palm the

clear arch of a fountain glitters in the tropical sun, sending up unceasingly its sparkling little stream to the top of the young palm." He then speaks of having already collected about 255 species of ferns as well as other plants. "The fine dry weather, which is now approaching, urges me again to renewed activity in the field. The woods here are very dense, and impenetrable without a sabre. The neighboring country is much diversified. In two or three hours' walk I can be in a region where the tropical fruits in all their luxuriance grow, while the products of the colony are rye, barley, oats, wheat, potatoes, beans, flaxseed, etc. The apple tree here is more shrub than tree-like, blossoms at all times of the year, and bears apples without seeds. * * * * The finest strawberries can be gathered a few steps from my door in great abundance during eight months of the year; blackberries are equally abundant. Of palms I have collected six species, of which five grow in the colony; tree ferns nine or ten species. Cruciferæ and Umbelliferæ are represented only by two or three species."

In a letter to Dr. Gray, under date of Nov. 25, 1855, he informs him that he had already collected 314 species of ferns, "of which at least 290 were collected at the colony, or from four to eight miles around it." He had also collected 1,850 species of flowering plants, and thought he might get 800 or 1,000 more of these, and perhaps eighty or a hundred more of ferns.

Late in 1855 or early in 1856 he returned to this country. About May 1 of the latter year he again sailed for Venezuela, and by July of 1857 had increased his fern numbers to 489 and of flowering plants to ,541. He busied himself also with Fungi for Dr. Curtis, Lichens for Prof. Tuckerman, and Mosses for Mr. Sullivant. He speaks of there being heavy white frosts in the high mountain regions, "and yet the stately wax palm on the neighboring heights, with its polished shaft of seventy or eighty feet, rears uninjured its slender form and its leaf-adorned head high above all other trees." Two statements taken from his journal will complete the extracts from his Venezuelan correspondence.

"In traveling from Victoria towards Valencia we find, about three miles west of Turmero, right in the middle of the road, the famous 'Zamang,' an enormous tree so well described by Alexander von Humboldt. Its head, formed by enormous horizontal branches, is the most remarkable part of this giant of trees. * * * I measured its head in its greatest diameter * * * most carefully, and found it to be 206 feet 11 inches English. Fifty-seven years ago it was found by Humboldt to measure in its greatest diameter 192 feet French measure, which would be equal to 204.48 feet English. Hence it follows that this tree, within the last fifty-seven years, has increased the horizontal diameter of its head only by 2 feet 5 inches English. The branches are loaded with a wonderful mass of epiphytes and parasites, and it seems surprising that branches of nearly one hundred feet in length, standing horizontally out from the trunk, can support for centuries, besides their own astonishing weight, such an extra load of heavy plants as Bromeliaceæ, Orchideæ, Cacteæ, Loranthaceæ, Piperaceæ, etc." The next relates to the celebrated "Cow-trees." "The space over which they were distributed was but very limited. * * * Their external appearance, the shape of the trunk and leaves, agree exactly with the description given by A. von Humboldt. Most of them were trees of 1 to 1½ feet in diameter, but very tall. In seven or eight of these trees, of different age and dimensions, I made incisions to see the milk flow. Although it was about the same season of the year when Humboldt saw the cow-tree between Valencia and Puerto Carbello, I never could elicit from them more than one or two drops in a second of time. There was not much difference in the flow of milk between the larger and smaller trees, and if ever I was disappointed in my expectation, it certainly was on this occasion as to the quantity of the milk. The milk has an agreeable, mild, rather rich taste,

and becomes somewhat sticky between the fingers. People who live not far off, and have tried these cow-trees, do not praise much their milk-yielding qualities. I have neither seen the fruit nor the flower of these trees, but in comparing its leaves with those of plants in my herbarium I find the closest resemblance in shape, structure and venation with some species of fig trees. The wood is white and of considerable hardness.*

Fendler returned to this country and settled again at St. Louis sometime in 1858. It is not necessary to recount his various occupations between this date and the time of his removal to Wilmington.

About the year 1873 the writer received a note from the late Dr. Engelmann, giving information that Fendler had settled at Seaford, Delaware, and requesting that some attention should be paid to him. After a short correspondence with the writer he determined to remove to Wilmington in the same State, where he purchased a small house and garden. In the latter he and his brother (who required some care) took great delight. At this time Fendler was about 60 years of age, rather tall and spare, dignified and pleasant in address, but very modest and often painfully diffident. The writer frequently took botanical excursions with him, and found him to be a devoted lover of nature and a most intelligent and faithful assistant in preparing and arranging specimens for the herbarium. The enthusiam with which he spoke of the wonderful and curious vegetation of the tropics will always be remembered by those who heard him; and his long and arduous journeys gave him much matter for entertaining conversation.

He was scrupulously honest and exact in every duty and business transaction, and it is within the writer's knowledge that he at one time suffered what his friends thought a most unjust loss, because of his determination to avoid a quarrel with any one.

He was now much engaged in getting ready for publication his "Mechanism of the Universe," in which he had given his ideas of cosmical phenomena. Nothing would persuade him that this book was not to bring him lasting fame, and no reasoning could discourage him from undertaking the expense of publication. All that could be done was to save him as much as possible. The expense proved to be comparatively small, but, in this respect, was much more than matched by the small sale of the work. The few commendatory letters which he received were treasured and re-read with the greatest pleasure by the gentle and guileless man.

As he says in his autobiography, it had been his intention to make Wilmington his permanent home; but a year or two after he settled there he was attacked by some rheumatic ailments, which not only caused the most acute suffering, but at one time seemed likely to end his career. Finally, when he had somewhat regained his health, he determined to seek a warmer climate, choosing, after some deliberation, the island of Trinidad. He and his brother sailed from New York on the 11th of May, 1877, and arrived at Port of Spain on the 3d day of June following. In a short time he bought a little property at Belmont, a suburb of this city, and at once commenced to plant the ground and otherwise improve his new home. He was more than ever delighted with the tropical flora, and thus wrote his impressions: "The gardens of some of the wealthy men here are of a splendor which, with regard to magnificence of vegetation, excels everything I have seen. Such beauty in form, such gorgeous colors portioned out among such an abundance of racemes, bunches, and scattered masses of flowers, is indescribable. * * * All efforts of the most able

*The "Cow-tree" (Palo de Vaca of the Spaniards) was described by Humboldt, Bonpland and Kunth as a genus under the name of Galactodendron utile. It is now considered as identical with the older genus Brosimum of Swartz, of which Bentham and Hooker recognize eight species, all tropical American trees with lactescent sap. As Fendler suspected they are nearly allied to the fig trees (Ficus), but it is possible, as his trees were such "poor milkers," that some species have a smaller flow of the milky sap than others.

writer can not but fail to give the reader an adequate conception of the brilliancy of such garden scenery and of the astonishing luxuriance of vegetation. Men and their habitations sink into insignificance beside the enormous trunks and heads of giant trees, and the busy town itself, looked at from the neighboring hills, lies hidden beneath their branches. * * * * Bananas and mangoes are plenty, and sell two for one cent. The mango, which when ripe is a delicious fruit, will be in its perfection in about a week, and will then sell much cheaper."

Again, in a letter to Dr. Gray, he writes: "Here, also, as in North America, June seems to be the month of flowers, at least as regards the cultivated ornamental shrubs and trees in Port of Spain. At present Poinsettia takes the lead, and shows off in great splendor. Think of specimens of this beautiful shrub 15 feet high, head 10 to 15 feet in diameter, with such an abundance of crimson leaves (4 to 7 inches long) as to hide nearly all the green leaves. The season for mangoes came to a close about the first of August, to be succeeded by what is here called 'Governor's Plums.' Next came the season for bread-fruit, ending about the 24th of October, and now we are entering the season for oranges."

Very soon he commenced collecting specimens for the herbarium, the ferns, as usual, being the first to demand attention. Within five miles of his residence he found, within a few weeks, "about 70 species." His aim was to make 50 sets for sale, and in the course of two months he had prepared more than 2,800 specimens. Those botanists who are so fortunate as to have these specimens can well allow his claim, that "as regards completeness, freshness of color and expression of characteristics" they were "all that could reasonably be desired and expected." As a demand arose he collected many specimens of mosses, lichens and phanerogamous plants.

Notes on the Conjugation of Spirogyra.

BY JOE N. ROSE.

During nearly two years study of the various species of *Spirogyra*, conducted in the botanical laboratory of Wabash College, my attention was repeatedly drawn to exceptional features in their conjugation. At Professor Coulter's request I have collected my notes upon this subject and figured the more striking cases. In explanation of the accompanying plate it should be said that it is entirely diagrammatic, with a view of bringing out the salient points, although most of the original drawings were made with a camera. This text is intended to be little more than an explanation of the figures, and but little interpretation of the facts is attempted.

Figure 1. In this case (*Sp. longata*) a single well matured zygospore fills most of the larger (*a*) and part of the smaller (*b*) cell. No evidence of conjugation other than through the partition between the two cells could be discovered. The old cell wall remaining somewhat firm accounts for the neck of the zygo-

spore. In the vegetative cell (*c*) is seen a constant result of the formation of a zygospore in a contiguous cell. In the fertilized cell (*a*) pressure seems to have been removed sufficiently to allow the pressure in the vegetative cell (*c*) to push outward the intervening partition, just as happens to a partition when a contiguous cell has been ruptured.

Figure 2. Occasionally two zygospores are found in the same cell, formed by the one act of fertilization, but usually somewhat smaller than those in adjoining cells.

Figure 3. Between the cells *a* and *a'* the usual conjugating tube has developed, and doubtless there has been a certain union of the contents, yet in each cell there is a perfect zygospore. They are not quite so large as those of adjoining cells. This condition of things was found as often as three times in the same pair of filaments. The bulging of the cell *c* into *a'*, owing to a relief of pressure in the latter, is apparent, but becomes very noticable in the next figure.

Figure 4. When a filament has broken up into unusually short cells and then conjugates with a large-celled filament, there is not always room for the zygospore in the female cell, and such distorted forms as those shown in the figure are the result. In this case the bulging walls of the vegetative cells have still further diminished the space.

Figure 5. The dumb-bell zygospore of this figure could not be explained, unless some such condition as in Fig. 1 shaped it until it became rigid. But of this there was not the slightest indication.

Figure 6. While in general terms in the case of conjugating filaments one may be called fertile and the other sterile, as expressing the usual direction of flow, yet zygospores are repeatedly found in the latter. In this figure there are four contiguous filaments. The first cell of *b* has been provided for by *a*, hence the first cell of *c* is compelled to send out a very long tube towards *d*. But the contents of *c* have already assumed the zygospore form while *d* still has its spiral band, as though the latter was too long in being reached.

Figure 7. In the two filaments represented conjugation has already taken place between some cells, and is being prepared for between *a* and *b*, yet *a* is a single banded cell, while in *b* there are two bands. So far as could be determined these two filaments represent two species, based upon the number of spiral bands.

Figure 8 shows an unusually great difference in the size of conjugating cells.

Figure 9. In this filament no conjugation was discovered in any part of it, but the cells *a* and *b* have each sent out a tube at their adjoining ends, as *c* and *d* are also beginning to do, while *c* has sent out an additional tube at the other end.

Figure 10 is doubtless a later stage of the last, the two tubes together conjugating with a third and lower cell.

Figure 11 is another phase of polygamous conjugation, while *Figure 12* shows strong inclinations in that direction.

GENERAL NOTES.

Acer pseudo-platanus is a common shade-tree about our streets. The fruit is now forming and in every raceme I find one or more of the samaras composed of three or four carpels, instead of the normal number, two.

Catalogue of New Brunswick Plants.—We are indebted to Mr. George U. Hay, of Carleton, N. B., for the Bulletin of the Natural History Society New Brunswick, No. IV. This contains "A preliminary list of the plants of New Brunswick," by Prof. James Fowler, M. A. The Rev. Mr. Fowler was for a long time a resident of New Brunswick, and has been the most active collector of the region. He now resides at Kingston, Ontario. We are surprised to find how recently botanical observation began in this province, and feel as if we could almost rank ourselves among the early collectors. The earliest published information dates back only to 1862, and in 1864 the writer collected largely about Fredericton, St. Stephen, and Campo Bello, continuing his work in the years 1866, 1868 and 1872. Unfortunately he has preserved very little material from those explorations. To return to Mr. Fowler's list, it is an extremely interesting one in many ways; its author was indefatigable in his researches. He has found some curious cases of extra-limital distribution. For instance at Eel River, Restigouche County, *Collomia linearis* occurs. "If it is not native, it is at least thoroughly naturalized." Mr. G. F. Mathew, of St. John, has elsewhere pointed out how the river St. John affects the distribution of plants. Indeed, the whole district is well worth further study. There are rich collecting grounds already familiar, like the marshes of the Kennebeckosis, but the flora of much the larger part of the province remains practically unknown. The members of the geological survey record what they find, but their attention is too much engaged upon other work to allow careful exploration. Not the least interesting part of the list is the appended catalogue of ballast plants gathered around St. John, Portland, etc. The list is well edited and printed, and will repay careful perusal.

Utricularia cornuta.—On Decoration Day it has been my habit for a long time to take an excursion in the woods. This year I was rewarded by seeing a most magnificent display of *Utricularia cornuta*, a mass of yellow liter-

ally covering one side of a secluded pond, and quite out of reach. Is this not an early date for it?—W. W. BAILEY.

The Torsion of Leaves.—The following is the substance in tabular form of a paper read before Section F of the Am. Ass. Ad. Sci. at its Philadelphia meeting, by Prof. W. J. Beal, of the Agricultural College, Michigan. In the case of plants whose leaves are not erect they are supposed to be erect when the direction of twist is given.

NAMES OF PLANTS.	Number of Plants examined.	Number of leaves examined.	Direction of Twist.	Number of revolutions.	REMARKS.
Chenopodium album	.....	.....	Indifferent	½	Structure of both surfaces alike: ¼ more stomata on lower. Keep same position during dry nights.
Typha latifolia	.....	Sev'l			
		1000	All with the sun	1½—2	Structure alike.
Typha augustifolia	.....	300	All with the sun	.....	Structure alike.
Sparganium—sp?	.....	75	All with the sun	1 or less.	Plants shaded.
Acorus calamus	A few	.....	Most with the sun	½	Young leaves most twist'd
Fritillaria imperialis	.....	.....	All with the sun	.....	
Allium carinatum	.....	.....	Most with the sun	½	
" porrum	104	.....	All with the sun	1	
" cernuum	.....	.....	Indifferent	½–1½	
Iris speciosa	.....	.....	Most with the sun	1 or less	
" three other species	.....	.....	Indifferent	.....	
Gladiolus, cult. vars.	350	.....	All against the sun	½	Structure alike. Twist greatest near tips.
Liatris scariosa	2	192	{ 179 with the sun	{	Structure alike: stomata 18 on lower to 12 on upper. Twist greatest near base.
			{ 13 against the sun.	{	
Phleum pratense	50	.....	All with the sun	.....	Seedlings.
" "	29	121	{ 117 with the sun	{	
			{ 4 against the sun	{	
Lolium Italicum	40	.....	All with the sun	.....	Seedlings.
Holcus lanatus	30	.....	All with the sun	.....	Seedlings.
Bromus secalinus	100	.....	All with the sun	.....	Young plants.
" Shraderi	50	.....	All with the sun	.....	
Hulless barley	50	.....	All with the sun	.....	
Clawson wheat	100	.....	All with the sun	½	
Triticum repens	.....	300	All with the sun	¾–1½	
Seedling oats	.....	.....	All against the sun	.....	

The author concludes that the conflicting facts observed do not furnish any satisfactory clue to the cause of torsion. Similar variation has been observed in the direction of twining *Calystegia sepium*. The twisting of the leaves may be of advantage to the plant in rendering the leaf more rigid and in allowing both sides to be exposed through part of the length to direct sunlight.

Zopf's Classification of the Bacteria.—The following arrangement of the bacteria by Zopf is probably the most satisfactory one yet proposed. The genera are distributed into four groups, as follows:

1. Coccaceæ. Possessing (as far as our present knowledge reaches), only

the coccus form, and in some species thread forms which are produced by the adhesion of the cocci. Spore formation as yet undemonstrated.

Genera: *Streptococcus, Micrococcus, Ascococcus, Merismopedia, Sarcina.*

2. Bacteriaceæ. Possessing mostly cocci, rods (straight or curved), and thread forms (straight or spiral). The first may be wanting; the latter have no distinction of base and apex. Division, so far as known, in one direction only. Spore formation existing, or wanting, or unknown.

Genera: *Bacterium, Spirillum, Vibrio, Leuconostoc, Bacillus, Clostridium.*

3. Leptotricheæ. Possessing cocci, rods, and thread forms (which show a distinction of base and apex). The latter straight or spiral. Spore formation not demonstrated.

Genera: *Leptothrix, Beggiatoa, Crenothrix, Phragmidiothrix.*

4. Cladotricheæ. Possessing cocci, rods, thread and spiral forms. The thread form is provided with false branches. Spore formation not yet demonstrated.

Genus: *Cladothrix.*—From *Die Spaltpilze.*

Stopper for Bacteria Culture Vessel.—In recent numbers of *La Nature* Dr. H. Fol, of Geneva, Switzerland, described, among other things pertaining to bacteria, a permeable stopper for culture vessels that has proved so valuable upon trial that we give an illustration and description of it. In most forms of culture vessels it is impossible to introduce or remove any substance without at the same time exposing the contents of the vessel in some degree to contamination from the germs of the air. In this form a small glass test tube an inch or so long, having a hole in the bottom, is wrapped with cotton and fitted into the mouth of the vessel. It is then half filled with glass wool or asbestos and protected by a mass of cotton (Fig. 1). The contents of the vessel are easily reached by removing the plug of cotton and introducing a capillary glass tube (Fig. 2), glass wool offering little resistance to such a tube while cotton can not be pierced. A translation of part of Dr. Fol's article has appeared in the *Scientific American Supplement*, and since the above was written the larger part of it has been given in *Science*.—J. C. A.

Fig. 1.

Fig. 2.

Bacteria as Vegetable Parasites.—The only genuine instance of parasitic bacteria in plants yet mentioned by the books (DeBary, Zopf, etc.) is that of the yellow sickness of hyacinths, first described by Dr. Wakker, of Amsterdam, in 1882. This bacterium winters in the bulb scales, and increases in the spring to slimy yellow masses which destroy the tissues and eventually kill the plant. The priority of demonstrating parasitic bacteria in plants belongs however, to an American. In 1880, two years before Dr. Wakker's announcement of bacteria in hyacinths, Professor T. J. Burrill, of Illinois, presented a paper before

the American Association for the Advancement of Science demonstrating the invariable presence of characteristic bacteria in the disease known as pear blight, which attacks pomaceous trees, and that the disease may be transmitted from tree to tree by inoculation. Since then the bacteria have been isolated and cultivated in artificial media, and the statements of the original paper fully confirmed. Americans should have credit for what little original work they do accomplish in bacteriology.—J. C. A.

The Cladophylls of Myrsiphyllum.—Gray's Structural Botany is quite wrong in stating (at least by implication) that the apparent leaves of Myrsiphyllum are vertically expanded, that is, are inserted edgewise on the branch. They are really and most obviously horizontally expanded, in the manner of true leaves. The vertical position which they soon assume is the result of a half twist, differing in this respect from Ruscus, in which the cladodia are vertical from the first. Professor Dickson calls attention to this, in an interesting paper in the Transactions of the Botanical Society of Edinburgh, vol. xvi. But, although the fibro-vascular bundles are arranged in one plane (as also in some species of Ruscus), yet he still regards the organ as a cladophyll. And the two elements of these bundles are disposed in the reverse order to that of the leaf.

In this connection it should be noticed that Van Tieghem (in Bull. Soc. Bot. France, xxxi., 81, 1884), maintains that this organ even in Ruscus is a leaf, the first and only leaf of an axillary branch, or when floriferous, is a leaf with a connate branch.—A. GRAY.

Flowers of the Wild Strawberry.—In this locality, and in other portions of the state where I have been this spring, the flowers of *Fragaria Virginiana* var. *Illinoense* are as constantly polygamous as they are in cultivated varieties. Flowers are either perfect or pistillate. The pistillate appear rather the more numerous. These flowers are commonly small, sometimes not exceeding one-fourth inch in diameter. There is seldom anything more than the merest indications of stamens in these flowers. The perfect flowers are larger, brighter in color, and the numerous yellow stamens render them conspicuous. I can now tell almost invariably the sex of a flower at a distance of two rods.—L. H. BAILEY, JR., *Agricultural College, Mich.*

Addenda et Errata.—In Dr. Koehne's article on the Lythraceæ of the United States, vol. x, pp. 269–277, the following corrections are to be made:

Page 269, line 7 from bottom, for unsymmetrical read symmetrical.

Page 273, line 31, for 1½ to 6½ mm. read, 4½-6½ mm.

Page 274, to *L. lineare* add New York, New Jersey, Delaware, Florida and Texas; Cuba; Guanajuato and Vera Cruz, Mexico; Virginia, *fide* Elliott.

EDITORIAL NOTES.

DR. C. BERG has been called to the chair of botany in the University of Buenos Ayres.

A CHAIR OF BACTERIOLOGY is to be established at the college of the Sarbonne at Paris.

A LIFE-SIZE statue of Charles Darwin has just been placed in the great hall of the British Museum.

THE FIRST BACTERIA ever seen were observed by Leeuwenhoek in 1683 in the white substance adhering to his teeth.

THE SPANISH GOVERNMENT has prohibited inoculation for cholera in districts where the disease has not yet appeared.

PROFESSOR V. M. SPALDING, of the University of Michigan, has leave of absence for a year's study in the botanical laboratories of Germany.

DR. GEORGE M. STERNBERG has gone to Europe at the request of the Department of State to attend the meeting of the Sanitary Council at Rome, held during June.

PROFESSOR A. N. PRENTISS, of Cornell University, sailed for Europe on June 20, to recuperate and make some botanical observations during the summer vacation.

RECENT NUMBERS of the *Gardeners' Chronicle* have been almost entirely devoted to orchids. A supplement gives the geographical distribution of all known genera, with a map.

A SMALL BOOK has been published in Germany by Johne on the details of the cultivation of Koch's cholera bacillus, and the very similar bacillus of Finkler, and has already reached a second edition.

AT THE RECENT cholera conference at Berlin there was much discussion regarding the bacteria connected with the disease, but each disputant appeared to hold the same views at the close as at the beginning.

THE BEST WORK on the germs in the air with methods of investigation is Miquel's *Des organismes vivants de l'atmosphère*, published in 1883. The author carries on his researches at the Montsouris Observatory near Paris.

THE OBSERVATIONS of Professor Trelease on the relations of some cecidomyid larvæ to parasitic fungi, published last year in *Psyche*, have been confirmed and extended by Dr. Fr. Thomas, of Thüringia, as we learn from *Irmischia*.

AN ITALIAN investigator, C. Comes, considers that the gummosis of mulberry trees is due to the alteration of the starch and young tissues by a specific form of bacteria, identical, however, with what he believes to be the cause of gumming in the peach, cherry, etc.

S. KORSCHINSKY has observed, according to the *Botanisches Centralblatt*, that the leaves of *Lactuca Scariola* only assume the meridianal position when growing exposed to strong sunlight, and that *Tanacetum vulgare* in the same situa-

tions directs its leaves toward the source of light, but without taking the meridian. He thinks the difference is due to the more flexible tissues in *Tanacetum* which permit the leaves to constantly change position, while in *Lactuca* the firmer tissues hold them rigid.

TELL Messrs. J. U. and C. G. Lloyd, of Cincinnati, Ohio, whether the following plants grow in your locality, and how abundantly: Coptis trifolia, Xanthorrhiza apiifolia, Aconitum uncinatum, Actæa alba, Actæa rubra, var. spicata, Cimicifuga Americana, Cimicifuga racemosa.

THE VERY EXTENSIVE library and herbarium of Mr. I. C. Martindale, of Camden, N. J., are for sale. The editors' opinion of their value and completeness has already been expressed. (See vol. ix., p. 163.) Any individual or institution that secures them will indeed secure a treasure.

A CATALOGUE of the fungi of Italy by P. A. Saccardo and A. N. Berlese, issued not long since, enumerates 6403 species distributed in seventeen orders. The smallest order is the *Entomophthoreæ* containing only the one species, *E. Muscæ*, and the largest the *Pyrenomyceteæ* with 1515 species. Other interesting orders are the *Uredineæ* with 340, *Myxomyceteæ* with 91, and *Schizomyceteæ*, or bacteria, with 64 species. Although this is a large list the authors yet regret that, owing to parts of the country being unexplored, it is still quite incomplete.

AN INTERNATIONAL Botanical and Horticultural Congress is to be held in Anvers, Belgium, August 1–10. The subject which will take the most prominent place in the discussion will be the botanical exploration of the Congo, which means the interior of Africa. Belgium is wide awake in these matters, and supported by an intelligent and interested sovereign the work can be well done. A liberal invitation is extended to foreign botanists, but while papers will be presented in six of the principal languages, of course the discussion will be conducted entirely in French.

THE ILLUSTRATION of the action on gelatine of the real and pseudo "comma bacillus" of cholera, given in a recent number of *Science*, with the cuts of the bacilli themselves by Dr. Sternberg in an earlier number of the same journal, brings this strange controversy graphically before American readers; a bitter partisan controversy, in which non-investigators have poor chance to form a correct opinion. It will doubtless be settled after the manner of the famous spontaneous generation controversy—by refined practical experience after due lapse of time.

PROBABLY FEW SUBJECTS have advanced so rapidly and to such important proportions as that of bacteriology. Ten years ago we had scarcely heard of it, to-day many of the first universities of Europe have established chairs devoted to the subject, while a number of institutions have been created for its exclusive consideration; there are besides several government commissions and hundreds of private investigators. On the other hand it has revolutionized some of the departments of medicine and surgery, is a constant theme in sanitary science, and has become an important factor in the daily life of every individual.

AN ORCHID EXHIBITION, under direction of the Royal Horticultural Society, was held in the conservatory at South Kensington, London, on the 12th and 13th of May. Sixty-one genera were represented. There were many specimens shown in fruit and numerous hybrids. Some of these hybrids were bi-generic. Three such have been raised and borne flowers, and others have been propagated, but have not yet flowered. How these bi-generic crosses will affect the stability of genera as at present circumscribed, is a conundrum which was propounded but not answered at the Orchid Conference with which the exhibition was connected.

BRYN MAWR COLLEGE, a new institution for the higher education of women, situated near Philadelphia, is to be opened in September. No pains have been spared to place the college on a firm foundation, and it promises to be a specially notable institution. Miss Emily L. Gregory, a graduate of Cornell University, has been appointed to the chair of botany. Immediately upon graduating in 1881 Miss Gregory went abroad, and studied under Prof. Wigand at Marburg, Prof. Reinke at Göttingen and Prof. Schwendener at Berlin. Returning to this country in 1883 she studied in Prof. Goodale's laboratory at Harvard, also taking charge of the laboratory work of the Harvard Annex. In 1884 she was appointed teacher of botany in Smith College, and shortly after received her present appointment at Bryn Mawr. She at once sailed for Europe to continue her studies under Prof. Schwendener, and will shortly go to Zürich to remain until the opening of the college in September. The curriculum of the College is in many respects modeled after that of the Johns Hopkins University. The course drawn up for botany reflects the thought and thorough preparation which Miss Gregory has given her subject.

THE PROSPECTS FOR an interesting gathering of botanists at Ann Arbor in August are excellent. Western botanists may be specially expected in force. The city of Ann Arbor is a delightful place in which to spend a week, even in the hottest weather, and at the worst no such discomfort can be experienced as was felt at Philadelphia last year. The meetings will not be disturbed by the rumbling of vehicles over the pavements, the distances will be short and through shady avenues, and altogether the outlook for the physical comforts is entirely satisfactory. The programme for the special entertainment of the Botanical Club is not yet definitely arranged, but as heretofore there will be short excursions for collecting, an evening reception, and similar social privileges to besugar the dry crusts of science, and promote that most valuable feature of these gatherings—personal acquaintance and the interchange of ideas. Neither the scenery nor flora immediately about Ann Arbor are striking. It is largely "oak openings," woodland interrupted with open ground, yielding only about 850 species of flowering plants and ferns within a radius of four miles. There are, however, several of the Michigan "catholes" within reach, in which one finds *Arethusa*, *Sarracenia*, *Andromeda*, *Menyanthes*, *Drosera* and other swamp plants. The Huron river runs through the lower part of the city and furnishes the usual supply of water plants. An examination of this part of the flora from a sanitary point of view will have a special

local interest as water works are soon to be established with the water supply from this source. The free excursion to the Saginaw valley will give the botanists a favorable opportunity to see the characteristic flora of Michigan. The steamer excursion, after adjournment, to Mackinac island and Sault Ste. Marie promises to be one of the most delightful ever offered the association. Every botanist who can command the time should certainly go, as the flora of that region is characteristic and specially interesting, the trip inexpensive, and the social and physical pleasures all that can be desired. The trip may be made in three or four days, but more time can be profitably spent. With such a favorable prospect it is safe to predict a most enjoyable and successful meeting, with a fair probability that the botanists will hold their recently gained vantage of ten per cent. of the total attendance.

CURRENT LITERATURE.

Louis Pasteur, His Life and Labors. By his son-in-law. Translated from the French by Lady Claud Hamilton. D. Appleton & Co., New York, 1885. 8°. Pp. xlii, 300.

Every reader must be charmed with this work. Its enthusiastic portraiture of the successes of a remarkable man, a man who does not tolerate failure, the glowing account of his devotion to the work of his life, the pertinacity with which he defends his views against all opponents, and the great pecuniary and commercial value of his discoveries, invest the work with more than usual interest. The chapter on the silkworm disease reads like a romance, ending with that sad stroke of paralysis which so nearly cost the hero his life. The silkworm disease had gradually reduced the silk industry of France till it yielded barely one-fifth the usual revenue, and, as many districts were largely dependent upon this source of maintenance, its failure entailed the greatest poverty and suffering upon the inhabitants. It was at the close of the famous controversy on spontaneous generation, in which Pasteur was so signally triumphant, that he undertook to solve the problem of this mysterious disease. We can not follow him through the successive steps of the difficult investigation to the final restoration of wealth and prosperity to the silkworm districts, but can assure the reader that the story is so fascinatingly told that whoever begins it is not likely to lay the book down before its completion.

The other great subjects of Pasteur's studies—fermentation, studies of wine and beer, splenic fever, fowl cholera, hydrophobia—are almost equally interesting. But it is only possible in this notice to call attention to the general nature of the work. The casual reader will find few technicalities to detract from the smoothness of the narrative, while to the student of bacteriology it is suggestive and stimulating. The value of the work is much enhanced by the admirable introduction by Professor Tyndall.

Micro-organisms and Disease, an Introduction into the Study of Specific Micro-organisms. By E. Klein, M. D., F. R. S. 2d ed. Macmillan & Co., London, 1885. Small 12°. Pp. 201. Illustrated.

Among the numerous works on pathogenic bacteria, which are being so rapidly turned out, this small book deserves an important position. The author is an experienced investigator who knows of what he writes, having been employed by the English government for many years to conduct such studies. The work opens with several concise but well written chapters on the examination

of bacteria, the materials, apparatus and methods of artificial cultures, and the means of inoculation and observation. These are ample to direct the investigator into the right course, and to give the reader a just appreciation of the difficulties which beset this kind of work.

The body of the book is given to the discussion of the various pathogenic species of bacteria and the more common, closely-related non-pathogenic forms, arranged upon the basis of Cohn's classification. Some space is also given to certain higher fungi having more or less relation to the health of the higher animals and man, such as yeast, *Oidium lactis*, *Aspergillus*, *Actinomyces* and *Saprolegnia*. The systematic part of the work is profusely and admirably illustrated with cuts that are well drawn, clear and finely printed.

The latter part of the book is devoted to a discussion of the rôle of septic and pathogenic forms, and will be found an excellent resumé of the present knowledge of the subject. The grounds of Buchner's belief, that septic organisms may, by attention to certain conditions of culture, be changed into pathogenic forms, as, for example, the harmless hay bacillus into the malignant anthrax bacillus, are reviewed and shown to be untenable, a conclusion already reached by DeBary and quite generally accepted by botanists, even by Zopf in the last edition of his *Spaltpilze*, contrary to the author's statement. After the examination of several other supposed cases of transformation of harmless into harmful bacteria, Dr. Klein very sensibly concludes that "some definite microorganisms have the power, when finding access into the body of a suitable animal, to grow and thrive and to induce a definite pathological condition. But this power they have *ab initio*. Those that do not possess it can not acquire it by any means whatever."

In conclusion we can most heartily commend the work to those who desire to become acquainted with the principal forms of pathogenic bacteria.

Die Spaltpilze, nach dem Neuestem Standpunkte Bearbeitet. Von Dr. W. Zopf. 3d ed. Eduard Trewendt. Breslau, 1885. Roy. 8°. Pp. 127. Illustrated.

This work was primarily written for the *Encyklopaedie der Naturwissenschaften*, and separately published in March, 1883. It met with such ready sale that in a few months the edition of 1,000 copies was exhausted, making it necessary to issue a second edition in January, 1884.

This was as eagerly sought for as the first, and but a year had passed when a third edition was demanded. Each successive issue has been improved and enlarged, especially the last, which contains one-fourth more pages and seven more wood cuts.

The work is devoted to the general treatment of the bacteria. It opens with the consideration of their position in the plant system and their occurrence in nature. The main portion is divided into four parts—morphology, physiology, methods of investigation, and descriptive classification.

The author takes up Cohn's theory of the constancy of bacteria forms, and his classification into coccus, rod, thread and spiral groups (monomorphism), and points out that they have now only historic value, as any two or more of these groups may have genetic relationship (pleomorphism). The author, however, disavows any intention to adopt ultra-pleomorphistic views, believing that for certain bacteria pleomorphism is surely proven while for certain other bacteria it can not at present be demonstrated. Yet in the latter case it may possibly be found, upon further investigation, that a similar variability does really occur. This possibility has its advantages, for, while it does not alter the facts, it does give an incentive to more exhaustive study. The classification which the author adopts, founded upon the structure and degree of development, is given elsewhere in this journal.

Under morphology the author treats of the forms and their metamorphoses, vegetative multiplication, growth, color, contents, and structure of the cells, organs of movement, formation of spores, and zoogloea condition. Under phys-

iology is given the nourishment of bacteria, their influence upon the medium in which they grow, their relation to temperature, gases, light, electricity, chemical substances and moisture. Under methods of investigation is a careful statement of the principal methods of work and observation. The part devoted to the description of species is far more satisfactory to the systematist than the usual treatment in pathological works. Each species has been studied from the botanist's standpoint, and has been assigned its proper place in the system, so far as present facts admit.

An important part of the work is the biliography of bacteria, including a list of nearly 350 authors. An excellent index completes the volume.

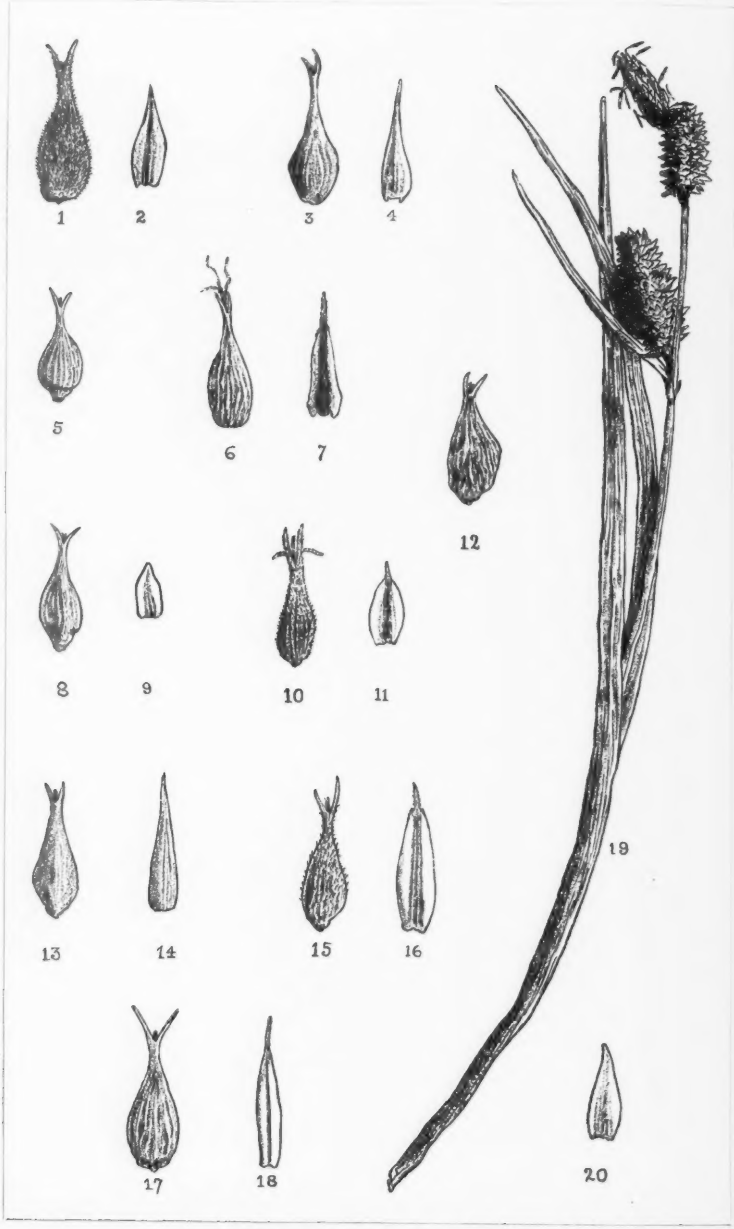
The Technology of Bacteria Investigation; explicit directions for the study of bacteria, their culture, staining, mounting, etc., according to the methods employed by the most eminent investigators. By Charles S. Dolley, M. D. S. E. Cassino & Co., Boston, 1885. 12°. Pp. 263.

The author says in the preface that the work has been written with the hope that it will stimulate careful study of the schizomycetes by American investigators. There can be no reasonable doubt that such manuals will have this tendency. The subject of bacteriology is exciting such universal attention that even in America we must ere long catch the general enthusiasm, and lend ourselves to the fascinating but difficult study of the "infinitely little." A few Americans have already done excellent work in this field, although one does not often find them mentioned by foreign authors. Let us see what help Dr. Dolley offers the student.

The work is divided into three parts: (*a*) General and (*b*) special methods of investigation, and (*c*) formulary. Under the first we have the study of microscopic preparations, both living and stained, and also by means of photography, followed by culture experiments, inoculation and biological analysis. Following each topic is the literature pertaining to it. The second part treats of the special methods used by different investigators in studying anthrax, cholera, glanders, hydrophobia, leprosy, malaria, tuberculosis, typhoid fever, diphtheria, erysipelas, yellow fever, etc., etc., each being followed by the literature of the subject. The third part contains about fifty formulæ for the preparation of stains, reagents, culture media, etc.

The value of such a work naturally turns upon the fullness and perspicuity with which the methods and apparatus are described, and upon their proper selection. The present work is excellent, so far as it goes, and will prove of great value to many investigators, but it still leaves much to be desired. The descriptions are short and sometimes quite inadequate; there are no illustrations, which in many instances would be as valuable as the descriptions; the work is evidently compiled from literature alone, and lacks that fullness of detail which the author could only give from personal knowledge of the manipulations; there is no index. The bibliography occupies one-third of the volume; a wholly unnecessary amount, as it is printed in full-size type, which, besides taking up extra room, obscures the clearness of the page.

Yet, whatever the defects are, this is a timely and welcome volume, one that will prove of service to the investigator, especially the beginner, and one that will foster the study of the subject.



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